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# The NPS Research Program: A National Asset

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## A National Asset

NPS's unique combination of operationally experienced students and defense-oriented faculty provide a superb setting to conduct interdisciplinary research on complex defense related issues. This is particularly true of issues related to the operational level of war. These projects can only be conducted at an institution that has the infrastructure needed to do sensitive work, faculty with experience and interest in defense related research, and graduate students with the talents and the operational backgrounds to understand the issues involved. This combination is simply not available at civilian graduate schools.

These projects are possible because NPS exists. The sponsors who asked that the projects be undertaken choose NPS based on their analysis of where they could get the research done in a timely way, at minimum cost, and with the confidence that those doing the work had a clear understanding of the nuances involved in providing deep but operationally implementable solutions.

The Technical Joint Cross Service Group (TJCSG) that computed Military Value Scores for technical facilities evaluated more than 200 facilities. Of these NPS was one of only five facilities that received a military value score for each of the 13 research technical areas. The other four were: Wright-Patterson AFB, NAS Patuxent River, Naval Research Laboratory, and White Sands Missile Range. This points out the breadth of the research undertaken at NPS and the clear focus on areas of primary importance to DOD. The TJCSG also identified 17 technological areas as having "significant importance to future warfighting capabilities." NPS faculty and students are involved in various research projects that support all 17 technologies.

It is worth noting that the TJCSG evaluated technical facilities across 13 different technical areas and in three functional areas: Research, Development and Acquisition, and Test and Evaluation. NPS received the highest military value rating of all facilities in "Battlespace Environments, D&A.

Here are some examples of projects underway or recently completed by NPS faculty and students.

**Maritime Domain Protection**

Faculty and students formed an integrated research team that drafted a proposed National Maritime Domain Protection Architecture with Concept of Operations and Command Structure.
The team tested the proposal in an interagency/joint war game, developed a MDP Library Base for classified interagency reference, and extended current data mining and fusion techniques and systems based on requirements generation. Another team is now examining port infrastructures in support of force protection.

**MARITIME COUNTER-TERRORISM**

A campus-wide research team of faculty, US and international students studied a number of problems concerned with maritime counter-terrorism in Southeast Asian waters. This campus-wide integrated study focused on defeating maritime terrorism and pirate-supported terror. Faculty from a number of departments cooperated in conducting this research. The study was helped by the presence of experienced students from Singapore who were able to use their hands-on knowledge of the operational issues involved to guide the research efforts.

**Dynamic Mapping of IED Incidents over Space and Time**.

Innovative thesis work used software from a faculty research project to display, animate, and statistically analyzes the SIGACT data from Operation Iraqi Freedom (OIF). Identifying change points in insurgency behavior is critical to effective counterinsurgency. Due to the continuous nature of the conflict and the volume of apparently random incidents, statistical process control techniques were and can be used to signal changes in insurgent tactics. This research continues at NPS by faculty and students, to further improve the programming components of the project. The NPS IED mapping program is also currently being used in-theater in Afghanistan.

**Helicopter Brownout.**

Helicopter Brownout is a $100 M per year problem, leading to significant hardware loss, injuries, and fatalities. Our objective is to find ways to define landing zones that will have reduced probability of producing brownout. The challenge is to remotely sense soil and surface characteristics in denied territory. Both civilian remote sensing systems and national technical means were and are being studied. Faculty and students have identified a system that can meet the requirement and are testing it for suitability. The payoff for this work will be to dramatically reduce the loss rate for men and hardware, particularly in the SOCOM and CENTCOM AORs.

**Man hunting workshop in support of us special operation forces.**

The traditional scope of military operations has never developed a doctrinal framework or process to capture fugitives; consequently military planners and intelligence analyst are not educated or trained in the investigated processes necessary to find fugitives. NPS faculty and Special operations students are conducting research to develop an investigative framework to understand the nature of man hunting in order to locate and apprehend fugitives and propose developmental courses of action.

**Tactical Network Topology (TNT)**

TNT is an integrated program of field experiments that develop new technologies to support near term needs of the warfighter. Major emphasis in on wireless networks, autonomous vehicles, sensor networks, situational awareness and target tracking and identification. Measures of performance of the technologies and operators using the technologies are also addressed. TNT is a faculty-student program working in parallel with partners that include various branches of the military, Combatant Commands, industry, and national labs. TNT makes extensive use of the airspace available for military use at Camp Roberts.

**Armoring Vehicles against Improvised Explosive Devices IEDs**

Supporting a request from the Office of the Deputy Secretary of Defense, NPS faculty and students are working on a project exploring protection schemes that have the potential of decreasing the vulnerability of lightly armored vehicles, such as Bradley APCs. Initial concepts will be assessed for increasing absolute protection and weight efficiency of armor, using lightweight assembly of discrete elements, arrayed in a manner that increases the number of angled contact surfaces that a projectile will have to encounter. This serves to deflect the flow of bomb fragment streams out of harm's way. The initial work on this project simulates an IED class bomb, and assesses the baseline effectiveness of steel armor against the threat. The project uses technical surveys and supporting data from SPAWAR and LLNL, with NPS faculty/student expertise in explosive ordnance and testing, shaped charge development, effectiveness analyses, hydrodynamic code development and simulation.

**Voice Authentication "Iraqi Enrollment" Project**

The Voice Authentication "Iraqi Enrollment" Project is an initiative that explores the use of voice authentication technologies for implementation in Iraq and potential uses in other stabilization and reconstruction efforts, such as Afghanistan. This faculty/student project is examining a proof of concept for a voice authentication system that can

improve visitation screening for detainees at Abu Ghraib and security screening for access to the International "Green Zone." The DLI is a partner in this effort.

**Southeast Asia Tsunami Relief: Hastily Formed Networks—Phuket & Khao Lok, Thailand**

Taking advantage of a pre-arranged visit to Thailand by NPS faculty, NPS was able to support tsunami relief operations "on the fly", providing broadband internet to victims, families, NGOs, local government, media, and volunteers. NPS organized a team of participants from COASTS (a NPS integrated research project), and in-country agencies to set up a hastily formed network ISO tsunami relief. Many lessons were learned and reported. NPS faculty returned in mid-February to enhance the network and build in redundant, remote monitoring/imaging capability.

**Advanced Battle Manager for the Ballistic Missile defense System**

This research program on ballistic missile defense is funded by the Missile Defense Agency, and benefits both STRATCOM and NORTHCOM. The research group here at NPS is helping to specify the Advanced Battle Manager (ABM) for the Ballistic Missile Defense System (BMDS). The ABM will be physically and logically replicated for use by all of the COCOMS. In addition, we are developing and transferring technology for use in developing the ABM and its components (weapons, sensor, C2, Intel, etc.) for use as a system-of-systems to support joint and coalition warfighters.

**Virtual Technologies and Environments**

This is a faculty/student project o develop deployable training solutions for Navy and Marine Corps operations that are (1) low cost, (2) reconfigurable, (3) easy to use for both trainee and instructor, (4) experimentally validated. The work is sponsored by ONR 342 (Cognitive, Neural, and Social S&T Division)

**Anti-Terrorism Force Protection**

This is a CNO sponsored project to develop analysis and visualization tools for planning and evaluating naval anti-terrorism/force protection concepts, systems, and tactics. Successful completion of this project is highly dependent upon the faculty and student team's current operational knowledge of Naval operations.

**Organizational Learning for the National Exercise Program**

This a new, major, research effort in support of the Office of Domestic Preparedness of the Department of Homeland Security (DHS) to investigate how organizations learn from success, failure and to help determine the role of simulations and "war games" for the DHS National Exercise Program

**The Delta3D Open Source Game-Simulation Engine**

NPS designed and built the US Army game: America's Army Game. However this was built around a commercial game engine. This project's goal is to construct a fully open source engine for use in a wide variety of game-based simulations for use in the CNO's strategy for the revolution in training. The project is supported by the Naval Education and Training command.

**LLNL – NPS Memorandum of Understanding**

The goal of this MOU is to advance the academic and scientific capabilities of both institutions in service to national security.
Researchers from both institutions will carry out research in 5 key areas:
National Security, Homeland Defense / Security, Space, Material Sciences, Laser Science.
A Joint Lecture Series that already exists will be expanded.

**Center for Inter-Disciplinary Remotely Piloted Aircraft Studies (CIRPAS)**

The Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) is a research center at the Naval Postgraduate School. CIRPAS provides measurements from an array of airborne and grounds based meteorological, aerosol and cloud particle sensors, radiation and remote sensors to the scientific community. The data are reduced at the facility and provided to the user groups as coherent data sets. The measurements are supported by a ground based calibration facility. CIRPAS conducts payload integration, reviews flight safety and provides logistical planning and support as a part of its research and test projects around the world. The center operates a variety of manned aircraft and Unmanned Aerial Vehicles. CIRPAS is also a National Research Facility of UNOLS.

**NPS Center for Autonomous Underwater Vehicles Research**

The Center for Autonomous Underwater Vehicle Research is a unique Center at NPS. The goals of the center are to educate Service Officers in the deployment and use of unmanned underwater vehicles and to develop and test new technology for addressing Mine Hunting, Mine Counter Measures, Intelligence, Surveillance Reconnaissance, and Maritime Dominance Missions. We operate the ARIES, and REMUS vehicles, and a sea based unmanned aerial vehicle (Scan Eagle) and are developing a new forward looking sonar capability for small UUVs. We are also developing experimentation with high speed command and control links to sub-surface, surface, and aerial assets for the transfer of video information, as well as command and control data. This cannot be privatized as its has joint synergism with the CIRPAS Center and participates with reimbursably funded experiments with Officer Students in their thesis work. Other civilian Universities would have to provide:

1. Close proximity to sea access
2. Close proximity to military air space
3. Staff with expertise in underwater robotics
4 Staff with expertise in aerial robotics
5 Location for Laboratories

all at a cost comparable with the low cost investment at NPS.

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